

ARDEC TECHNICAL REPORT STYLE GUIDE

Logistics Support Engineering Directorate
Systems Support Team

Editorial Services
Extension 2618
Building 1

FOREWORD

Ideas are the most important product of a research and development activity. At the U.S. Army Armament Research, Development and Engineering Center, those ideas--encompassing unique new designs and materials, improved manufacturing processes, and effective pollution control techniques--are communicated to the industrial and scientific community by means of technical reports. Although ARDEC's scientists and engineers do not work under the threat of "publish or perish," they are encouraged to use this particularly effective medium to document their research and distribute their findings. The purpose of this book is to make it easier for them to do so.

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INTRODUCTION

This guide was prepared to assist ARDEC's scientists and engineers and their contractors in writing technical and contractor reports, to reduce the time required to publish reports, and to improve their quality.

The guide is based on ANSI Standard Z39.18-1987, "Scientific and Technical Reports: Organization, Preparation, and Production." When the editorial staff edits a report and prepares it for printing, their objective is to produce a quality report that complies with this established standard. However, it is to your advantage to consider them as early in the publication process as possible, preferably when you are writing the first draft of the report. This procedure will reduce editing time and expedite publication.

Contractor reports should conform to the same publication standards and format as in-house (internally prepared) reports.

REPORT ELEMENTS

ANSI Standard Z39.18-1987 established the order of the elements in a technical report. The report elements, which start as right-hand pages, are indicated with an asterisk.

Front cover

Disclaimer and disposition statement

*Report Documentation Page (SF 298)

*Foreword (optional)

*Acknowledgment (optional)

*Symbols and Abbreviations (optional)

*Table of Contents

List of Figures

List of Tables

*Summary (optional)

*Main text (Introduction, Conclusions, and/or Recommendations)

*Figures (optional)

*Tables (optional)

*References (only necessary when referenced in main text)

- *Bibliography (optional)
- *Appendixes (optional)
- *Special Terms or Glossary (optional)
- *Distribution List

FORMAT

The author's draft of a technical report should be typed DOUBLE-SPACED on white bond paper with a 1-in. margin at the top and bottom, a 1-in. margin on either side, and two spaces above and one below each centered heading; one-space above and one below each subheading.

Do not number headings, sections, or paragraphs or use outline symbols in the final draft. (Lists of conclusions, recommendations, tests, etc. may be numbered, however.)

The main headings sectionalize the text. They are centered above the text and typed entirely in BOLD capital letters. Subheadings are identified by levels:

First Level

First level headings start at the left margin. The first letter of each word is capitalized except for prepositions and connectives (to, for, and, etc.). Use bold face, if available, but DO NOT underscore and DO NOT use a period. The first word in the paragraph following the first level heading is indented five spaces.

Second Level

Second level headings are indented five spaces. The first letter of each word is capitalized except for prepositions and connectives. Use bold face, if available, but DO NOT underscore and DO NOT use a period. The first word in the paragraph following the second level heading is indented 10 spaces.

Third Level. Third level headings are indented 10 spaces. The first letter of each word is capitalized except for prepositions and connectives. Use bold face (preferred) or underscore the heading and use a period at the end. The first word in the first third-level paragraph begins on the same line as the heading. Succeeding paragraphs under the same heading are indented 15 spaces.

Quoted material and numbered lists are indented five spaces further than the first word of the paragraph in which they appear. Quoted material is typed in block format as follows:

"This is a sample of the correct format for typing quoted material."

"If the quoted material includes more than one paragraph, use quotation marks at the beginning of each paragraph; but use closing quotation marks at the end of the last paragraph only."

Carry-over lines in numbered lists are lined up with the first letter of the first word as follows:

1. This is a sample of an entry in a numbered list, properly indented, with the carry-over line starting under the first letter of the first word
2. In a numbered list, do not use a period at the end of the entry unless it contains more than one sentence

Number the front matter (foreword, table of contents, etc.) with consecutive lower case Roman numerals beginning with the first page following the SF 298 (considered the title page; no other title page is used). Like the report documentation page, the following pages in the front matter all start as right-hand (odd-numbered) pages:

- Foreword
- Acknowledgments
- Symbols and Abbreviations
- Table of Contents

If any of these elements continues for more than one page, print the continuation page head-to-head.

Number pages in the text with consecutive Arabic numerals beginning with the first page of text following the table of contents (usually the first page of the summary or introduction) as page 1. Continue with consecutive numbers throughout the report, including the appendixes and the distribution list. In addition to the first page of the text, the following elements all begin as right-hand pages:

- Figures
- Tables
- References
- Appendixes
- Glossary
- Distribution List

Leave the preceding, even-numbered page blank if necessary to accommodate this format.

When both metric and U.S. customary (English) units of measurement are used, type the metric unit first, followed by the English unit in parentheses: 107 mm (4.2 in.).

The special format and markings prescribed by AR 380-5 for classified reports are covered in a separately published supplement to the Style Guide.

Foreword

If you begin your report, as most do, with an introduction as the first section in the body of the report, you probably do not need a foreword. One of the chores in editing a report is to compare the foreword with the abstract, the summary, the introduction, and the conclusions to be sure this is not repetitive information.

The terms "preface" and "foreword" are used interchangeably. In ARDEC technical reports, foreword is preferred.

Acknowledgment

Acknowledgment, particularly of other ARDEC personnel, is discouraged. However, if the author has a legitimate reason to acknowledge the assistance of someone else (an unpaid consultant, a university library), the acknowledgment will appear in the front matter of the report.

Symbols and Abbreviations

In a report in which symbols and abbreviations are used frequently, they should be identified the first time they appear in the text and may be included in a separate list if there are many of them.

Table of Contents

The table of contents always begins on a right-hand page and is simply identified as "CONTENTS."

All major (centered) headings (Introduction, Discussion, Conclusions, etc.) and first level subheads are listed in order in the table of contents. If the report is long and complex, second and third level subheads may also be listed.

List of Tables and Figures

Listing tables and figures in the front matter of the report is optional if there are less than five; mandatory, if there are five or more. (Tables and figures that appear in appendixes are not included.) Lists will begin on the page following the table of contents, unless both the table of contents and the lists are very short and can be accommodated on one page.

Summary

If you include a summary in your report, check it against the abstract, foreword, introduction, and conclusions. If the summary repeats the information in these elements, try to determine if you really need to include it.

Short reports consisting of six or eight printed pages of text should not include summaries. However, summaries of longer reports (40 to 50 typed pages) can be extremely helpful to busy people who need information and have several reports to read.

Introduction

The introduction should tell the reader briefly the purpose and scope of the report. Remember, in the body of the report, you are going to present an account of your investigative activities including results, conclusions, and recommendations, but not in the introduction. You may also need to present some background material that prepares the reader to understand what you did and why you selected the methods that were used.

Main Text

The main text (or body) of the report should conform, generally, to the style of a journal article, in which the significant aspects of the project or program are presented in narrative form. You may use tables and figures, of course, to supplement the text and enhance the presentation, but **DO NOT INCLUDE GOVERNMENT FORMS, COVER LETTERS, DF, SOP, SCOPES OF WORK, TRIP REPORTS, ETC.** (The reproduction of personal signatures is prohibited by regulation.) Such material is inappropriate in a technical report and tends to distract the reader and obscure significant details.

Use different levels of headings, especially in long, complex reports, to help the reader make the transition from one topic to the next. Although paragraph numbers (1, 1.1, 1.1.2) and outline symbols (I, A, 1, a) are not used in the final report, topics from the outline you used to organize your writing can serve as headings. Properly indented, these headings make the structure of the report clear to the reader. It is seldom necessary, however, to use more than three levels. Too many headings distract the reader, breaks up the report into excessively small units, and detracts from its appearance.

Conclusions

If your report is carefully organized and well written, the reader will have arrived at your conclusions by the time they are presented. **DO NOT PRESENT NEW INFORMATION IN THE CONCLUSIONS.** Instead, provide the reader with generalizations that summarize the ideas he has been accumulating.

Since conclusions are derived from the work described in the report, present them in straightforward statements without discussion and explanation. The most important conclusions should be given first.

If the results of a research project are negative (that is, the idea does not work), if the experiment technique turns out to be inappropriate, or if the information obtained is less useful than originally expected, a frank statement to this effect is preferable and more helpful to the reader than irrelevant generalizations.

Do not use abbreviations or acronyms in conclusions and recommendations without spelling out the terms for which they stand.

Recommendations

When the conclusions of an investigation indicate a specific course of action, a separate section recommending such action may be added. If the recommendations are based on the preceding conclusions, present them in the same order as the conclusions, even though each conclusion may not lead to a recommendation.

Some research reports do not provide a basis for foreseeable action; therefore, they do not contain recommendations. In other reports, where results are board in application, it is not feasible to include all of the recommendations that the project supports.

Figures

Illustrations are important in helping to reinforce the key ideas in a report. Nevertheless, they should be used only when they add something significant, simple, clear, and self-explanatory. Nothing is accomplished by making the report a depository for all the illustrations accumulated during the life of the project. They simply dilute the impact of the report and complicate the publication process. It is particularly important to avoid the use of a long series of essentially repetitive figures.

All illustrations in a report (photographs, drawings, sketches, graphs, etc.) are referred to as figures. Each must have a figure number and a brief but meaningful caption that describes the figure in enough detail to make it essentially self-sufficient. The reader should not have to consult the text of the report to understand the figure.

Arabic numerals are used for numbering figures. Figures are usually grouped at the end of the report in the order in which they are cited in the body of the report, but may be integrated in the text if there are only a few and they do not interrupt the train of thought.

Photographs should be sharp, clear prints with maximum black and white contrast. They should emphasize the item discussed, and all extraneous background clutter should be eliminated.

Although photographs are useful for illustration purposes, details can often be shown more clearly in a line drawing. Experimental apparatus, for example, is more effectively presented in schematic form than in a photograph. This is particularly true if the only photographs available are of poor quality.

Xerox or other inferior copies are rarely acceptable for reproduction. Always provide the originals of figures (or a copy of equivalent quality) marked on the back to identify the proper orientation (TOP, BOTTOM). However, write LIGHTLY and do not clip, staple, or punch photographs that can make them unsuitable for reproduction.

Keep graphs as simple as possible. A graph containing numerous intersecting curves and detailed legends obscures rather than clarifies the point it is intended to make. Curves should be traced on paper without a grid or drawn on blue graph paper (blue does not reproduce). A fine grid reproduces unevenly and makes it difficult to see the curve clearly when the graph is reproduced.

Figure titles are centered UNDER the illustration. The word Figure and appropriate Arabic number are centered on one line with the title centered on the next line. Only the first letter of the first word in the figure title is capitalized unless a proper name is included. Carry-over lines are also centered. Example:

Figure 1
Variations in stack performance using cell from different
material batches

If a figure is too large to fit an 8 1/2 by 11-in. page, it can be reduced to the appropriate size by the Print Shop. The dimensions of such figures and the lettering used on them should be selected with this reduction in mind. If the figure is so large that it will not be legible if reduced, it can be reproduced on a foldout page. However, since fold-out pages greatly increase printing costs, they should be used only when absolutely necessary. [Foldouts are always right-hand (odd numbered) pages, with the reverse side left blank.]

Illustrations in color are not used in technical reports unless there is no other way to show essential details (before and after shots of a stream polluted with pink water, for example). The Print Shop has the capability to reproduce colored illustrations at an extra cost per printing.

Tables

Tables should be designed to support the text and make it more meaningful for the reader. They can do this best if they are clear and to the point. RESIST THE TEMPTATION TO INFLATE YOUR REPORT BY INCLUDING CUMBERSOME COLLECTIONS OF IRRELEVANT NUMERICAL DATA AND/OR REAMS OF RAW DATA. Unfortunately, tables are sometimes included in a report only to serve as a final resting place for the masses of unevaluated results that inevitably pile up in project folders. Tables are usually grouped together (following the figures) in the order in which they are cited in the text.

NOTE: Since ARDEC's reports tend to have far more pages of tables and figures than text, it is usually impractical to intersperse the tables and illustrations among the pages of the text. However, if there are relatively few tables or figures, and particularly if there is a close relationship between the discussion in the text and the tables or figures, it is preferable to include them in the text. In some cases, a few tables or illustrations may be included in the text and the rest grouped at the end.

Table titles are centered at the TOP of each table. The word Table and the appropriate Arabic number are centered on one line with the title centered on the next line. Only the first letter of the first word in the table title is capitalized unless a proper noun is included. Carry-over lines in the title should be centered. Do not use a period after the title.

Footnotes in tables are noted by consecutive superscript lowercase letters. Each table has its own sequence of footnote letters, beginning with "a." When only one footnote appears on a table, however, an asterisk is used. The footnote reference appears at the top right of the footnoted work symbol or heading.

A typed line extending 2 in. from the left margin of the table is used to separate the body of the table from the footnote. The footnote itself is in block form and begins flush with the left margin following the superscript letter or asterisk. A PERIOD IS USED AT THE END OF EACH FOOTNOTE. Footnotes for tables that are more than one page long may be repeated on each page on which they are cited.

List the applicable units of measurement in column headings. Do not repeat them in the columns. DO NOT USE A PERIOD FOLLOWING A TABLE ENTRY UNLESS IT FORMS A COMPLETE SENTENCE. Be consistent in format, punctuation, and abbreviations.

References

In the main text, the format for references should be as follows:

- It represents. . .begin with the pin pallet escapement (ref 1).
- This initial. . .mechanism (ref 2) in which. . . gear train.
- These necessary. . .first stated in reference 3.

List references numerically in the order in which they are mentioned in the text of the report. (NOTE: If the number of references is limited and they are only cited once, they may be treated as footnotes in the text. Other publications related to the subject of the report, but not specifically cited in the text, may be listed in a bibliography using the same format as the references.) Accuracy in referencing is essential because the reader may use referenced material in analyzing your report. Sources of information (such as personal conversations, correspondence, trip reports, etc.) that are not available to the reader should be treated as footnotes and not as references.

References should be in block form as shown in the examples given. Note that the titles of books and periodicals (journals) are underlined. The titles of reports, journal articles, papers, etc. are enclosed in quotation marks.

Journal Article

Bleakney, W. and Stoner, R., "The Attenuation of Spherical Shock Waves in Air," Journal of Applied Physics, Vol 19, No. 7, pp 882-85, July 1949.

Book

Schafer, H.F., Electronic Structure of Atoms and Molecules, Addison-Wesley Publishing Company, Cleveland, OH, 1972.

Technical Report

Brown, Robert R., "Reaction of Plastics to Extreme Temperatures," Technical Report ARAED-TR-84211, ARDEC, Picatinny Arsenal, NJ, 1984.

NOTE: For reports that have not been printed, but are in preparation, the term "in press" is used in lieu of a publication date.

In-House Contractor Report

Fried, D.L., "Adoption of Thick Chopper Wavefront Sensor Hardware for Operations as a Shearing Interferometer," Report TR-322, Optical Sciences Company, Placentia, CA, January 1979.

Reference Book/Pamphlet

American National Standard Mathematical Signs and Symbols for Use in Physical Sciences and Technology, ANSI 10.20-1975, The American Society of Mechanical Engineers, New York, NY, 1976.

Unpublished Dissertation

Rojwithya, C., "Peak Responses of Randomly Excited Multi-Degree of Freedom Structure," Ph.D. Dissertation, Civil Engineering Department, The University of New Mexico, Albuquerque, December 1980.

ARDEC Contractor Report

Monroe, James, "Dust Explosives," ARDEC Contractor Report ARAED-CR-86025, Mountain Powder Company, Jackson, PA, September 1986.

Unpublished Paper

Baum, C.E., "Electromagnetic Topology: Basic Concepts and Relations to Graph Theory," Paper presented at 24th Midwest Symposium on Circuits and Systems, Albuquerque, NM, June 1981.

Memorandum

U.S. Department of Defense, Memorandum by Undersecretary of Defense William J. Perry on the use of metric dimensions in technical reports, studies, and position papers, Washington, DC, 4 June 1979.

Computer Program

CLINGER, Computer Science Department, University of Texas at Austin, 1979.

Classified Report

McVey, E.M., "Advanced Fire Control Radar Systems (U)," Technical Report ARFSD-TR-96222, ARDEC, Picatinny Arsenal, NJ, October 1996, CONFIDENTIAL

NOTE: Do not include classified reports as references in reports approved for public release.

Bibliography

Any references not cited in the main text, but can be used for further information should be placed in the Bibliography. They should be in block form as shown in the example:

Personal Communication

Horowitz, J.B., Telephone communication concerning current research on pulsed laser hot-spot tracking, Project Officer, Laser Department Division, Advanced Radiation Technology Office, Air Force Weapons Laboratory, Kirtland Air Force Base, NM, 17 March 1982.

Glossary

A glossary is a list of terms defined and explained to facilitate a reader's comprehension of the report where numerous terms requiring definition are used. Such terms should be defined or explained at their first mention in the text. Glossary terms are arranged in alphabetical order, each on a separate line followed by its definition.

Appendixes

Appendixes are used to present supplementary material that is necessary for completeness, but which, if inserted into the main body of the report, would detract from the orderly and logical presentation of the work. Any material that can be referenced or placed in the project file should not be used as an appendix.

An appendix should not be used, however, as a catch-all for leftover bits of information and data that you could not fit into the body of the report. Bulky documents, especially those already published and available from DTIC or other sources, should not be used. Citation in the list of references is the appropriate way to bringing such documents to the reader's attention.

LABORATORY REPORTS, PRINTED FORMS, RAW TEST DATA, ETC. SHOULD NOT BE INCLUDED IN THE APPENDIXES. With rare exceptions, nothing is gained--and much may be lost--by including such material. This practice complicates the publication of the report; adds greatly to the expense of printing, microfilming, and handling; makes it more difficult for the reader to use; and detracts from the appearance and professional quality of the report.

When more than one appendix is included in a report, identify each by a letter: Appendix A, Appendix B, etc. The appendix format is the same as that followed in the body of the report. Tables, figures, and equations within an appendix are identified by the appendix letter and sequential numbers; for example: figure A-1, table B-3, etc. Remember, however, that the page numbers continue the sequence of Arabic numerals used in the body of the report.

Each appendix should be cited in the main text. Any material that is not associated with the subject closely enough to relate specifically to the text should not be included.

A title page with the title of the appendix centered in the middle of the page precedes the text, for example:

APPENDIX A THEORETICAL APPROACHES

The back of the title page is left blank, and the title is not repeated on the first page of the appendix text.

The use of computer printouts is discouraged. When they are included, however, they are usually handled as appendixes. Large quantities of such data can cause problems in the publication of the report. The following information (taken from a NASA pamphlet, "Data Preservation") is included to help minimize such difficulties.

"First of all, do not use any more printout than is absolutely necessary. It is difficult to read in the printed version, and sometimes completely illegible in later facsimile copies. (You would be surprised how many of your readers have to work with microfilm or facsimile copies of your report.)

"If possible, plan to have the printer programmed to print headings above each column or each page-size increment of the printout. Make sure the (computer) operator knows the print-out will be a camera ready copy so he can use a fresh black ribbon and proper settings to insure the best job. For easier reading, solid columns of numerals can be broken by a space at intervals.

"Be sure plain white paper is used. Lined form stock is usually unsatisfactory, because the gray lines come out black in the printed copy and make the tabulation difficult to read."

Distribution List

The author of the report is responsible for compiling the distribution list. There is no standard list, except for the short mandatory list (including IRC, other AMCCOM libraries, and DTIC), because the distribution of the report is limited to the author, his supervisor, his associates on the project, and individuals or organizations whom he knows to be interested in or closely involved with the subject matter. (NOTE: Other than those for MMT and MTT reports.) THE AUTHOR'S "STOCK-PILING" OF COPIES TO HAND OUT AT RANDOM AND THE DISTRIBUTION OF COURTESY COPIES TO INDIVIDUALS NOT DIRECTLY INVOLVED IS PROHIBITED BY REGULATION. This policy is not intended to restrict the distribution of the report, but to properly support DTIC's function of secondary distribution. On receipt of its copies, DTIC advertises the report by publishing the abstract in an announcement bulletin that is widely distributed both in government and the private sector. All subsequent requests for copies are answered by DTIC.

The IRC receives two copies of each report, which are maintained as archive copies. The DTIC receives 12 copies of all unclassified/unlimited reports and two copies of classified and/or limited distribution reports. All the addresses in the following distribution are mandatory.

For classified reports, sequential copy numbers are stamped on each copy before it is distributed by Editorial Services. Unclassified reports are not assigned copy numbers; only the quantity of copies to each addressee is included on the distribution list. The ZIP code must be included in each address.

It is not good practice to use personal names in the distribution list. An individual's involvement with a project usually ceases if he or she is transferred, retired, or otherwise disassociated from the office, while the office's involvement usually continues. IF THE USE OF A PERSONAL NAME IS NECESSARY (AS IN THE CASE OF AN INDIVIDUAL CONSULTANT OR INDEPENDENT RESEARCH), HIS OR HER ADDRESS SHOULD BE CONFIRMED BEFORE THE LIST IS SUBMITTED TO EDITORIAL SERVICES.

The distribution list is always published as the last item in the report and is listed in the table of contents.

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China Lake, CA 93555-6001

Chemical Propulsion Information Agency
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unclassified and classified

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P.O. Box 8000
Corona, VA 91718-8000

Only public release reports

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Watertown, MA 02172-0001

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[Office symbol]
[Date]

[Inside address]

I am writing to request permission to reprint the following material from your publication:

[Author, title, date of publication]

[Pages on which material appears or other identifying information]

This material is to appear as originally published (or with changes or deletions noted on the attached copy) in the following technical report, which the U.S. Army Armament Research, Development and Engineering Center is currently preparing for publication:

[Author, title, approximate number of pages]

If you are the copyright holder, may I have your permission to reprint the material described above in my report? Unless you request otherwise, I shall use the conventional scholarly form of acknowledgment, including author and title, publisher's name, and date.

Thank you for your consideration on this report. A duplicate copy of this letter is enclosed for your convenience.

Sincerely,

[Technical Report author's name]

The above request is approved on the conditions specified below and on the understanding that full credit will be given to the source.

Approved by:

Date:

STYLE AND USAGE

Style

Keep your writing simple and straightforward. Mark Twain once said, "I never write 'metropolis' when I get the same pay for 'city'." Follow his advice and use plain words. If you are talking about a rod, don't call it a "solid product of circular cross section." If you are talking about smoke, don't call it a "persistent obscuring combustion product."

Usage

Use plural verb forms with media, phenomena, and criteria; singular verb forms with medium, phenomenon, and criterion.

Data may be used with either singular or plural verb forms, provided the choice is observed constantly. If the plural is used, pronouns to data must also be plural.

Be conservative in your use of capital letters so that they retain their appropriate degree of emphasis and identification. The excessive use of capitals in the following sentence, for example, dilutes their effectiveness:

The M68E1 Practice APERS Mine is similar to the M18A1E1 APERS Mine except that it includes the M33 Inert-Loaded Practice Mine Body and empty M10 Practice Blasting Cap instead of the HE-Loaded M18A1 Mine Body and the HE-Loaded M4 Blasting Cap.

Except when they appear in headings or titles, it is neither necessary nor desirable to capitalize all of the words in item nomenclature. The model number provides the official identification.

Lower case the initial letter in trigonometric functions (cos, sin, etc.). Capitalize the initial letter in the symbols for chemical elements (Si for silicon, Yb for ytterbium).

In paragraph headings, the second part of a capitalized compound word is also capitalized (Contractor-Controlled Information); however, the root word in hyphenated prefix words (Pre-set) is not capitalized unless it is a proper noun (Non-American).

Such expressions as "10 times longer" or "5 times smaller," often used in scientific and engineer literature, are not exact. The first is ambiguous and the second is meaningless. The writer of "10 times longer" probably means "10 times as long," but the first phrase could mean "11 times as long." The writer of "5 times smaller" means "one-fifth as large" and should say so.

It is confusing to hyphenate the expressions "from 7-13 or between 7-13." Why expect the reader to fill in the blanks? Write "from 7 to 13 or between 7 and 13."

Avoid redundancy: "Table 3 is a tabulation showing. . ."

Use straightforward nomenclature in text: "aircraft illumination signals" NOT "signals, illumination, aircraft," "105-mm HE cartridge M456" NOT "cartridge, 105 mm: HE, M456."

Avoid legalistic expressions such as hence, herein, hereinafter, and aforesaid.

Most words with the prefix "non" are printed solid, unless the root word is a proper noun or adjective derived from a proper noun (non-European).

Cite appendixes, figures, references, and tables in the body of the report by parenthetical expressions: (app A), (fig. 1), (refs 1 through 3), or (table 1). Abbreviate the words equation, figure, and reference in parenthetical citations, but spell them out in the text of the report.

Watch for commonly misspelled words (foreword, liquefy, rarefied, fluorescent, occurred, homogeneous, accommodate, phosphorus, and others). Also gage and enclose are preferred spellings.

The subject and verb of a sentence must agree in number and person. Problems with agreement are usually caused by the subjects being incorrectly identified and usually occur when a long phrase or clause containing plural nouns intervenes between the subject and verb:

"Analysis of the complexity and costs of tests of this type prompt me to conclude that they are no longer practical."

In this example, the subject Analysis calls for the singular verb prompt.

Place the degree symbol (°) at the end of each element in a series of temperature readings (90°, 95°, and 100°C). Do not use a degree symbol with Kelvins and angles.

PUNCTUATION

It is important to remember that punctuation, used properly, is more than just a convention. It is a tool used to achieve coherence and clarity in writing. George Summary, author American Punctuation, defines punctuation as ". . . the use of certain conventional marks for the purpose of making written material clear at sight."

Commas

To avoid possible confusion, a comma should precede the final "and" or "or" in a series of three or more elements (a, b, and c).

Use commas to enclose interrupting and parenthetical elements: "The test, it must be assumed, will give correct results if it is conducted properly."

In some sentences, commas are essential for clarity. They help the reader to understand a sentence that might otherwise require rereading or interpretation: "When the high-velocity round struck the target was shattered by the impact." A properly placed comma clarifies the meaning: "When the high-velocity round struck, the target was..."

Restrictive clauses (identifies or defines the antecedent noun) are used without commas: "People **who live in glass houses** shouldn't throw stones." Nonrestrictive clauses are always set off by commas: "The audience, **which had at first been indifferent**, became more and more interested."

Dashes

The dash separates; the hyphen joins. In print, the dash is a single line at least twice as long as the hyphen. In typing, the dash is constructed from two hyphens. The dash, not the hyphen, is used to enclose a word or group of words that interrupts the main structure of a sentence: "Some of the components to be tested—the bolt, the spring, and the washer—were not available at the time." Notice that there is no space between the dash and the words that precede and follow it.

Diagonals

Avoid the use of diagonals (/) except in measurements [to mean "per" (g/L] and nomenclatures established by usage [(and/or) and (HMX/RDX)].

Ditto Marks

Never use ditto marks ("), they are ambiguous.

Hyphens

Use hyphens:

To connect compound numbers from 21 to 99 when they are spelled out (twenty-two)

To connect compound nouns used as units of measurement (kilowatt-hour)

To avoid doubling a vowel or tripling a consonant (ultra-atomic, shell-like)

To form a unit modifier immediately preceding the word modified (fire-tested material, 155-mm projectile); however, in a series of compound modifiers, hyphenate only the one adjacent to the noun (long range, rocket assisted, high-explosive projectile). The hyphen is omitted in unit modifiers when both metric and English units are used [2.74 m (9 ft) opening].

To prevent mispronunciation or to avoid ambiguity (re-cover, pre-position)

To join a number to the name of a chemical element (Uranium-235)

To join a single letter to a noun or participle (x-ray)

To prevent misunderstanding and improve clarity (nitroglycerin-containing explosive); however, such expressions can often be made clearer by rewriting (an explosive that contains nitroglycerin).

Use suspended hyphens for a series of adjectives that would ordinarily be hyphenated (10-, 15-, and 20-mm samples). Note that there is a space following each comma in the series. Do not use hyphens in predicated adjectives. (The projectile is 20 mm in diameter but the 20-mm projectile malfunctioned.)

Parentheses

A parenthetical sentence, which is itself part of a longer sentence, needs neither a capital letter nor a final period (this is an example). However, an independent parenthetical sentence requires a capitalized first word and terminal punctuation, which is placed inside the closing parenthesis. (Note this parenthetical sentence.)

When a parenthetical expression is placed at the close of a sentence, the punctuation follows the closing parenthesis (as in this parenthetical expression).

No punctuation should be used before the opening parenthesis of a parenthetical expression within a sentence. When punctuation is necessary (as after this parenthetical expression), it follows the closing parenthesis.

Quotation Marks

Closing quotation marks always follow the comma and period but precede the colon and semicolon:

The most significant sections in the report on nuclear instruments are: “Producing Nonenergetic Neutrons,” “Ion Accelerators,” Liquid Scintillation Spectrometry.”

The test report defined the trajectory as “highly irregular”; however, the development of the prototype was continued.

Semicolons

When connective words (however, therefore, nevertheless, thus, also, etc.) join two independent clauses, use a semicolon before the connective word and a comma following: “The sample was badly damaged; nevertheless, important measurements were made.”

ABBREVIATIONS

Use abbreviations consistently. If the abbreviation is not commonplace, show it in parentheses the first time the word or phrase it represents is used. Use a similar explanation for symbols and acronyms. Also, spell out acronyms in the abstract and in the conclusions and recommendations for readers who may not read the text.

Omit periods except after Latin abbreviations; abbreviations which spell words such as inch (in.), atomic (at.), figure (fig.), number (no.); abbreviations accepted by usage (c.g. for center of gravity), and the abbreviation for United States (U.S.). United States may be abbreviated when preceding Government or the name of a government organization (U.S. Army), but should be spelled out when it is used as an adjective in association with the names of other countries (British, French, and United States Governments), or as a noun (the United States). A list of commonly used abbreviations and special terms can be found in the appendix.

Do not begin a sentence with an abbreviation.

Use abbreviations of units and the symbol for percent (%) only when preceded by a numeral (9-mm strip, 25%).

Hyphenate abbreviations of measurements that constitute a nomenclature (4.2-in. mortar, 155-mm gun).

Do not use:

thru for through

w/o for without

& for and

for number

@ for at

" ditto mark for ANYTHING except quotation marks

l for liter

MATHEMATICS

The printing of mathematics is almost always difficult, but it is often made unnecessarily so by carelessly prepared manuscripts. Many of the printing problems can be avoided by scrupulous attention to notation and the arrangement of equations. Keep notations consistent, differentiate capital and lower case letters, identify Greek letters and any unusual symbols, and carefully align superscripts and subscripts. If the typist who prepares the draft manuscript (the one submitted to Editorial Services) is not accustomed to handling equations, it is preferable for the author to write them in neatly by hand. He or she should also identify the name of the Greek alphabet, which (when hand-written) might be confused with letters from the English alphabet.

α alpha

η eta

β beta

ρ rho

ϵ epsilon

τ Tau

κ kappa

ν nu

μ mu

ω omega

When an equation is introduced by when, where, thus, etc., omit punctuation following the introductory term.

Always leave a space before and after the equals ($a + b = c$) and after a sign indicating addition, subtraction, multiplication, or division.

Equal signs should be centered horizontally on the principal parts of the equation.

Line up principle values of equations with each other, not with subscripts or superscripts.

Place equation numbers at the right margin in parentheses.

However, do not enclose equation numbers in parentheses when cited in the body of the text [equation 1 not equation (1)].

NUMBERS

Include a zero before all decimal points that are not preceded by a number (0.23).

Write quantities that have a decimal value of less than one in the singular form (0.5 meter). Quantities greater than one are expressed in the plural (110 kilograms). However, when abbreviations are used, the quantity is always expressed in the singular (110 kg).

Do not repeat in parentheses a number that has been spelled out [twenty-one (21)].

Spell out numbers that occur at the beginning of a sentence. If a large number appears at the beginning of a sentence, try to rewrite the sentence.

If two numbers appear adjacent to one another, spell out one of them (24 8-mm strips should be written twenty-four 8-mm strips or 24 eight-millimeter strips).

Spell out numbers under 10, except in expressions of time, measurement, and money (2-sec delay, 1-kg sample, \$3.00). Use numerals for numbers 10 and greater.

In reports on items dimensioned in metric units, use metric units of measurement in addition to or instead of United States customary (English) units. When both units are used, the metric unit appears first, followed by the English unit in parentheses. If a unit is cited more than once on the same page, it is not necessary to repeat the English equivalent every time. English units that constitute nomenclature (8-in. projectile, 5-ft drop test, etc.) should not be converted to metrics.

FOOTNOTES

Cite footnotes in the text of the report by consecutive superscript Arabic numerals; in tables by superscript lower case letters; and in appendixes by a alpha-numeric combination (A-1, A-2, etc. However, when only one footnote appears in a report or in a table, use an asterisk.

Place the footnote reference in the superscript position at the top right of the footnoted word, symbol, or heading. Place a footnote reference at the end of a sentence outside the punctuation.

Use a typed line extending 2 in. from the left margin to separate the text from the footnotes. Type the footnote in block form, beginning flush with the left margin following the superscript Arabic number or asterisk. Capitalize only the first letter of the first word unless a proper noun is included. USE A PERIOD AT THE END OF ALL FOOTNOTES, EVEN THOSE THAT ARE NOT COMPLETE SENTENCES. Double-space between footnotes.

PROCESSING THE MANUSCRIPT

The completed draft should be reviewed for technical accuracy and the distribution statement should be selected by the appropriate Division Chief who approves the report for editing by signing part 1 of the SMCAR Form 49. As indicated on the form, he or she may also sign part 2 of the form at this time, approving the report for publication, or withhold approval for publication until after the reproduction copy had been reviewed. IN EITHER CASE, PART 1 MUST BE SIGNED BEFORE THE DRAFT IS SUBMITTED TO EDITORIAL SERVICES FOR PROCESSING.

Forward the approved draft to Editorial Services, (Bldg. 1) with:

- A completed SMCAR Form 49, signed by the Division Chief
- A completed Standard Form 298
- A 3.5 high-density disk containing the report (Microsoft Word), CD, or e-mail file
- An up-to-date distribution list (including the mandatory addresses)

Editorial Services will assign an ARDEC report number to the report. It is then edited and a paper copy marked with the corrections. The changes are reviewed with the author and the corrected copy is returned to him/her for proofreading.

Upon return of the report to Editorial Services, corrections are made if necessary, and the final copy is taken to the Print Shop for printing. The Print Shop charges for this service and must be supplied with a job order number and cost center. The repo copy, the edited draft, and all file materials are returned to the author after the report is distributed. The SMCAR Form 49 is filed with the archive copy of the report in the Information Research Center (Bldg. 59).

SMCAR Form 49

In addition to authorizing Editorial Services to process the technical report, the Division Chief also selects the distribution statement and indicates his selection (and the reasons for his choice) by checking the appropriate boxes on the form. (The six distribution statements and the reasons for their selection follow.) The statements are extracted from "Interim Procedures for Assigning Distribution Statements on DoD Technical Documents," released by the Secretary of Defense in a memorandum dated 18 October 1983 entitled, "Control of Unclassified Technology with Military Application," implemented by DoD Directive 5230.24.

1. DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.
 - a. This statement may be used only on unclassified document that have been cleared for public release by competent authority in accordance with DoD 5230.9.
 - b. Document with this statement may be made available or sold to the public including foreign nationals, companies, and governments, and may be exported without a license.
 - c. This statement may never be used on technical documents that formally were classified, without a positive determination of such releaseability by the DoD controlling office prior to release.
 - d. THIS STATEMENT SHALL NOT BE USED ON CLASSIFIED DOCUMENTS.

REVIEW AND APPROVAL OF ARDEC TECHNICAL REPORTS

_____		_____
Title		Date received by IRC
_____		_____
Author/Project Engineer		Report number (to be assigned by IRC)
_____		_____
Extension	Building	Author's/Project Engineers Office (Division, Laboratory, Symbol)

PART 1. Must be signed before the Information Research Center (IRC) edits draft report.

- a. The draft copy of this report has been reviewed for technical accuracy and is approved for editing.
- b. Use Distribution Statement A____, B____, C____, D____, E____, or F for the reason checked on the continuation of this form.
 - 1. If Statement A is selected, the report will be released to the National Technical Information Service (NTIS) for sale to the general public. Only unclassified reports whose distribution is not limited or controlled in any way are released to NTIS.
 - 2. If Statement B, C, D, E, or F is selected, the report will be released to the Defense Technical Information Center (DTIC) which will limit distribution according to the conditions indicated in the statement.
- c. The distribution list for this report has been reviewed for accuracy and completeness.

Division Chief (Date)

PART 2. To be signed either when draft report is submitted or after review of reproduction copy.

This report is approved for publication.

Division Chief (Date)

SMCAR Form 49, 1 Nov 94 supersedes SMCAR Form 49, 1 Nov 84, which may be used until supply is exhausted.

2. DISTRIBUTION STATEMENT B: Distribution limited to U.S. Government agencies only; (fill in reason); (date). Other requests for this document must be referred to ARDEC, ATTN: AMSTA-AR-WEL-TL, Picatinny Arsenal, NJ 07806-5000.

a. This statement may be used on unclassified document or on classified documents, if necessary, to ensure distribution limitation in addition to need-to-know requirements imposed by DoD 5200.1-R or in the event the document is declassified.

b. Reasons for imposing Distribution Statement B include:

Foreign Government Information	To protect and limit distribution in accordance with the desires of the foreign government that furnished the technical information. Information of this type is normally classified at the CONFIDENTIAL level or higher in accordance with DoD 5200.1-R.
Proprietary Information	To protect information not owned by U.S. Government and not protected by a contractor's "limited rights" statement, but received with the understanding that it may not be transmitted outside the U.S. Government.
Test and Evaluation	To protect results of test and evaluation of commercial products or military hardware, when such disclosure may cause unfair advantage or disadvantage to the manufacturer of the product.
Contractor Performance	To protect information in management reviews, records of contract performance evaluation, or other advisory documents evaluating programs of contractors.
Export Limitations	Document contains information that may be released to foreign nationals by U.S. Government agencies only when approved by competent authority, or contains information that would require an export license if foreign release is intended.
Administrative/Operational Use	To protect technical or operations data or information from automatic dissemination under the International Exchange Program or by other means. This includes publications required solely for official use or strictly for administrative or operational purposes. This statement may be applied to manuals, pamphlets, technical orders, technical reports, and other publications containing valuable technical operational data.
Software Documentation	Release only in accordance with the provisions of DoD Instruction 7930.2.

Specific Authority	To protect information not specifically included in the above reasons and discussions, but which requires protection pursuant to valid documented authority such as Executive Orders, classification guidelines, Export Administration Regulation (EAR), International Traffic in Arms Regulations (ITAR), DoD or DoD component regulations or policy guidance. When filling in the reason; cite "Specific Authority (identification of valid documented authority)."
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3. DISTRIBUTION STATEMENT C: Distribution limited to U.S. Government agencies and their contractors; (fill in reason); (date). Other requests for this document must be referred to ARDEC, ATTN: AMSTA-AR-WEL-TL, Picatinny Arsenal, NJ 07806-5000.

a. May be used on unclassified documents or on classified documents, if necessary, to ensure distribution limitation in addition to need-to-know requirements imposed by DoD 5200.1-R, or in the event the document is declassified.

b. Reasons for imposing Distribution Statement C include:

Critical Technology	To protect information and technical data which advance the state-of-the-art or describe new technology in an area of significant military application, or relates to a specific military deficiency of a potential adversary. This control on critical technology will allow early dissemination to the U.S. Government and its domestic contractors in a manner that will ensure compliance with the International Traffic in Arms Regulations (ITAR) and Export Administration Regulations (EAR).
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Administrative/ Operational Use	Same as under Distribution Statement B.
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Specific Authority	Same as under Distribution Statement B.
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4. DISTRIBUTION STATEMENT D: Distribution limited to DoD and DoD contractors only; (fill in reason); (date). Other requests shall be referred to ARDEC, ATTN: AMSTA-AR-WEL-TL, Picatinny Arsenal, NJ 07806-5000.

a. May be used on unclassified documents, or on classified documents if necessary to ensure distribution limitation in addition to need-to-know requirements imposed by DoD 5200.1-R, or in the event the document is declassified.

b. Reasons for imposing Distribution Statement D include:

Premature Dissemination	To protect information on system or hardware in the the development or concept stage, which must be protected to prevent premature dissemination.
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Software Documentation	Same as under Distribution Statement B.
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Critical Technology Same as under Distribution Statement C.

Specific Authority Same as under Distribution Statement B.

5. DISTRIBUTION STATEMENT E: Distribution limited to DoD components only; (fill in reason); (date). Other requests must be referred to ARDEC, ATTN: AMSTA-AR-WEL-TL, Picatinny Arsenal, NJ 07806-5000.

a. May be used on unclassified documents or on classified documents if necessary to ensure DoD distribution limitation in addition to need-to-know requirements imposed by DoD 5200.1-R or in the event the document is declassified.

b. Reasons for imposing Distribution Statement E include:

Foreign Government Same as under Distribution Statement B.
Information

Premature Same as under Distribution Statement D.
Dissemination

Software Documentation Same as under Distribution Statement B.

Critical Technology Same as under Distribution Statement C.

Specific Authority Same as under Distribution Statement B.

6. DISTRIBUTION STATEMENT F: Further dissemination only as directed by ARDEC, ATTN: AMSTA-AR-WEL-TL, Picatinny Arsenal, NJ 07860-5000; (date) or higher DoD authority.

a. Normally used only on classified documents, but may be used on unclassified documents when specific authority exists.

b. Distribution Statement F is used when the DoD originator determines that information is subject to special dissemination limitation specified by paragraph 4-505, DoD 5200.1-R.

c. When a classified document assigned Distribution Statement F is declassified, the statement shall be retained until the controlling DoD office assigns the proper distribution statement from this interim policy.

7. In addition to the distribution statement, the following notice(s) may be used on all documents assigned Distribution Statement B, C, D, E, or F.

WARNING

INFORMATION SUBJECT TO EXPORT CONTROL LAWS

This document may contain information subject to the International Traffic in Arms Regulation (ITAR) or the Export Administration Regulation (EAR) of 1979 which may not be exported, released, or disclosed to foreign nationals inside or outside the United States without first obtaining an export license. A violation of the ITAR or EAR may be subject to a penalty of up to 10 years imprisonment and a fine of \$100,000 under 22 U.S.C. 2778 or Section 2410 of the Export Administrative Act of 1979. Include this notice with any reproduced portion of this document.

For classified reports, the distribution list must be sent to Security for approval, and the SMCAR Form 49 annotated with the following statement:

This distribution list has been submitted to and approved by the Security Division, PSED.

Project Engineer (date)

FRONT COVER

The front cover for an in-house (locally originated) report is prepared by Editorial Services. For contractor report, Editorial Services prepares a sample cover for the contractor's guidance, which includes the report number and the AD-E (accession) number.

Titles

The report title, which appears on both the front cover and the report documentation page (SF Form 298), should be brief and meaningful. It should also accurately represent the content of the report. In developing a title, try to compromise between a title so short that it tells the reader little about the report and one so long that it is almost an abstract.

Here are some examples of poor titles:

Six Degree-of-Freedom Nonlinear Asymmetric Aerodynamic Attitude
Controlled Guidance Trajectory Simulation

A Surface-Launched Fuel Air Explosive Mine Neutralizer Study

Facts and Problems Connected with Preparation of Delay Compositions

Part of the problem with the first two titles is that the reader must wait to the very end to discover the real topic of the report. In the meantime, he has been thoroughly confused by a long series of nouns used as adjectives (noun stacking) and has great difficulty determining what is modifying what. It is important to remember that titles should be written in conventional English word order using standard idiomatic expressions. The third title is a bad one because it is so vague and general that it tells the reader very little about the contents of the report.

Do not include expressions as "A Study of" or "An Investigation of" in the title. Obviously the report must be based on a study or investigation. **More important, however, is the fact that the Defense Technical Information Center (DTIC), which advertises the report in its Announcement Bulletin and makes secondary distribution, is limited to using the first five words of the title in its data bank.** Consequently, wordy, obscure titles severely limit the report's retrievability.

Do not use mathematical symbols or Greek letters in titles or abstracts. DTIC's announcement bulletin and other publications in which the reports are cited may not be able to accommodate superscripts, subscripts, or foreign alphabets.

Authors

For in-house reports, the author's name is printed in straightforward word order with no further identification (exactly as it appears on the SF Form 298). For contractor reports, the author's name is followed by his company's name and address. Except for military rank, titles are not used in technical reports.

Disclaimers and Disposition Instructions

The reverse side of the front cover includes the following, as appropriate:

Mandatory Disclaimer (on all reports)

The views, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation.

Commercial Disclaimer

The citation in this report of the names of commercial firms or commercially available products or services does not constitute official endorsement by or approval by the U.S. Government.

Disposition Instructions

For unclassified reports:

Destroy this report when no longer needed by any method that will prevent disclosure of its contents or reconstruction of the document. Do not return to the originator.

For classified reports:

When this report is no longer needed, Department of the Army organizations will destroy it in accordance with the procedures given in AR 380-5. Department of the Army contractors will destroy this report according to the requirements of Section 14 of the Industrial Security Manual for Safeguarding Classified Information. All others will return the report to the Information Research Center (AMSTA-AR-LS), U.S. Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ 07806-5000.

REPORT DOCUMENTATION PAGE (STANDARD FORM 298)

The report documentation page is the title page of the report (no other title page is used). It is included primarily for the use of the DTIC that will, ultimately, make the report available to other agencies in government and private industry.

THE DATA ON THE SF 298, PARTICULARLY THE KEY WORDS AND THE ABSTRACT, ASSURE RETREIVABILITY AND SHOULD BE CONSIDERED AMONG THE MOST IMPORTANT ELEMENTS IN THE REPORT. If you do not have room on the form to include all of the data in the block provided, continue on the back of the form. To complete the form properly, refer to the following directions.

Block 1: Leave blank

Block 2: Enter the actual publication date (not the date on which the project was completed).

Block 3: Indicate whether the report is interim, final, etc. and enter dates of the period covered, such as the life of the contract in a final contractor report.

Block 4: Enter the title in all capitals letters exactly as it appears on the cover.

Block 5: Enter the complete contract or grant number(s) under which the work reported was accomplished.

Block 6: Enter the author's name.

Block 7: For in-house reports, enter the name, office symbol, and address of the performing activity. For contractor or grantee reports, enter the name and address of the contractor or grantee who prepared the report and identify the appropriate corporate division, school, laboratory, etc., of the author along with the ARDEC address. List city, state, and ZIP code. For Materials Testing Technology (MTT) reports add the following address:

Director
U.S. Army Materials Technology Laboratory
ATTN: (get symbol from project engineer)
Watertown, MMA 02172

Block 8: Fill in if you organization has assigned a number for reference. In contractor reports, the contractor's number goes in this block.

Block 9: Enter the following address:

ARDEC, LSED
Information Research Center (AMSTA-AR-WEL-TL)
Picatinny Arsenal, NJ 07806-5000

Block 10: Leave blank. Editorial Services will assign the report number.

Block 11: Enter information not included elsewhere but useful, such as: Prepared in cooperation with. . .Translation of (or by). . .Presented at conference of. . .To be published in..

For all MMT reports, enter the following statement:

This project was accomplished as part of the U.S. Army's Manufacturing Methods and Technology Program. The primary objective of this program is to develop, on a timely basis, manufacturing processes, techniques, and equipment for use in product of Army materiel.

For all MTT reports, enter the following statement:

This project has been accomplished as part of the U.S. Army's Materials Testing Technology Program, which has for its objective the timely establishment of testing, techniques, procedures, and prototype equipment (in mechanical, chemical, and nondestructive testing) to ensure efficient inspection methods for material/materiel procured and maintained by AMC.

This space will also be used for the classification authority and declassification date or OADR in accordance with AR 380-5.

Block 12a: Enter distribution statement. The date in the distribution statement should be the publication date.

Block 12b: Leave blank.

Block 13: The abstract should be brief (not over 200 words), clear, and complete and should contain a statement of the purpose of the work, the methods by which it was accomplished, the results, and the conclusions.

The abstract should be written in complete sentences. Avoid a style that reads like rough notes or a telegram. Use the articles a, an, and the where they are required by accepted usage. Spell out Greek letters and avoid the use of chemical and mathematical formulas with superscripts and subscripts.

Remember that the abstract will be circulated by DTIC and read by people who do not have the report available to them. It should not be necessary to read the report in order to make sense of the abstract. Illustrations, tables, and references from the report should not be cited in the abstract.

Since the abstract is entered on the report documentation page, it should not be repeated in the body of the report.

Block 14: Select words or short phrases that identify the principal subjects covered in the report and are sufficiently specific and precise to be used as index entries for cataloging. Always include the subject of the report. It is especially important that the first five words in the title include keywords because of the title search file of the DTIC data bank triggers on only the first five words.

Block 15: Enter the total number of pages on which printing appears, including both the front and back of the cover.

Block 16: Leave blank

Block 17: Enter the highest classification of the report (UNCLASSIFIED, CONFIDENTIAL, SECRET, etc.)

Block 18: Enter the highest classification of this page (UNCLASSIFIED, CONFIDENTIAL, SECRET, etc.)

Block 19: Enter the highest classification of the abstract (block 13) (UNCLASSIFIED, CONFIDENTIAL, SECRET, etc.)

Block 20: Complete this block to assign a limitation to the abstract UL (unlimited) or SAR (same as report).

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-01-0188	
<p>The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden to Department of Defense, Washington Headquarters Services Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</p> <p>PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.</p>					
1. REPORT DATE (DD-MM-YYYY)		2. REPORT TYPE		3. DATES COVERED (From – To)	
4. TITLE AND SUBTITLE				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHORS				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAMES(S) AND ADDRESS(ES) ARDEC, WECAC Information Research Center (AMSTA-AR-WEL-TL) Picatinny Arsenal, NJ 07806-5000				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER (Include area code)
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REPORT DOCUMENTATION PAGE				<i>Form Approved</i> OMB No. 0704-01-0188	
<p>The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden to Department of Defense, Washington Headquarters Services Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</p> <p>PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.</p>					
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				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
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a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER (Include area code)